Chapter 1

Drinking Water

Indicator 1: Public Drinking Water Quality

Figure 1

Public Drinking Water Systems in Kentucky and Violation Trends

Facility Size (Population Served)	Number of Systems* 1993	1995	1997	Number of Systems w/Violations** 1993	1995	1997	Number of Drinking Water Violations**(percent total) 1993	1995	1997
<101	220	207	168	130	138	68	733(46%)	620(47%)	289(40%)
101-500	188	162	145	90	109	58	436(27%)	408(31%)	227(31%)
501-1,000	65	59	55	19	32	19	80 (5%)	77 (6%)	50 (7%)
1,001-2,500	132	132	128	64	52	35	129 (8%)	111 (8%)	72 (10%)
2,501-3,300	46	46	45	30	18	9	59 (4%)	26 (2%)	14 (2%)
3,301-5,000	47	47	47	23	13	8	50 (3%)	24 (2%)	13 (2%)
5,001-10,000	80	80	80	41	21	24	80 (5%)	37 (3%)	39 (5%)
10,001-50,000	57	58	57	25	18	15	35 (2%)	21 (2%)	20 (3%)
50,001-100,000	3	3	3	1	1	1	1(<1%)	1(<1%)	1(<1%)
>100,000	2	2	2	0	2	2	0	2(<1%)	4 (<1%)
Total	**840**	**796**	**730**	**423**	**404**	**239**	**1,603**	**1,327**	**729**

**Includes public community, noncommunity, and non-transient systems. **Includes violations of drinking water standards (MCLs), monitoring, and reporting violations. Does not include Phase II and V chemical testing results or bottled water facilities. Percents rounded. Source: Ky. Div. of Water*

Background The federal Safe Drinking Water Act of 1974 and its amendments regulate the nation's public drinking water to ensure it is safe for consumption. An estimated 3,075,623 Kentuckians (82%) now has access to public drinking water provided by 730 public drinking water systems. Kentucky assumed authority in 1977 from the U.S. Environmental Protection Agency (EPA) to implement the provisions of the Safe Drinking Water Act. While drinking water supplied by public water systems is generally considered safe for consumption, there still are problems. Tracking the number of public drinking water systems with violations can provide an indication of the quality of the Commonwealth's public drinking water.

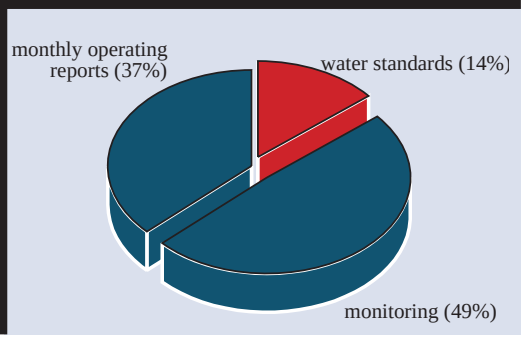
Source Pollutants can enter raw drinking water sources in a number of ways and come from a variety of sources. In Kentucky, polluted runoff from farmlands and coal mines and discharges from wastewater treatment plants are the greatest source of water pollution. Other pollution sources include failing septic systems, sewage straight pipes, waste sites, urban runoff, combined sewer overflows, and toxic spills.

Goal Ensure public drinking water can be safely consumed by meeting federal and state Safe Drinking Water Act rules and regulations that specify 83 health-based Maximum Contaminant Levels (MCLs), 14 secondary standards, monitoring and reporting requirements, and treatment techniques.

Progress In 1993, 50% of the state's public drinking water systems had one or more violations of Safe Drinking Water rules. By 1997, the percent of systems in violation had dropped to 33%, a significant improvement in five years. Forty-nine percent of the violations cited during 1997 were failure to properly monitor while 37% were reporting infractions. Fourteen percent of the 729 violations cited in 1997 were for exceeding MCL health-based drinking water standards. It should be noted that data from Phase II and Phase V chemical monitoring for 1993 through 1998 has not been compiled

Figure 2

Types of Public Drinking Water System Violations in Ky. (1997)



Note: Based on 687 violations. Does not include Phase II and V chemical testing results. Source: Ky. Division of Water

by the Kentucky Division of Water and is not included in the above numbers.

Small public water systems remain the greatest violators of drinking water regulations. A small system is defined as serving fewer than 3,300 people. These systems accounted for 90% of the drinking water violations in 1997. Many of these systems do not have the expertise, equipment, or resources to meet various requirements of the Safe Drinking Water Act. The Kentucky Division of Water has encouraged mergers of small nonviable systems in an effort to improve drinking water quality. Between 1979 and 1998, 555 drinking water system mergers have occurred. There are approximately 26 mergers per year.

These mergers have eliminated a number of poorly operated plants. But problems remain. For example, during 1997, 13 public water systems serving a total of 3,852 people were in significant noncompliance—up from the ten systems EQC reported in 1996. Significant noncompliance means that a system had 12 or more violations of Safe Drinking Water Act rules in 12 consecutive months.

Under the Safe Drinking Water Act Amendments of 1996, all states are required to develop a Source Water Assessment Program (SWAP). A key component of Kentucky's SWAP is to assess a water source's susceptibility to contamination. Currently, 183 systems in Kentucky depend on groundwater for public drinking supplies. These 183 systems serve 572,950 Kentuckians. Thirty of the 183 community drinking water systems are in the process of developing wellhead protection plans. Of these 30, three communities have fully implemented their wellhead protection plans.

There are also 262 noncommunity systems serving mobile home parks, restaurants, schools, campgrounds, and state parks that rely on groundwater for drinking water supplies. These systems serve an estimated 45,373 people. Currently, 28 of these systems, serving a total of 1,251 people, are in the process of developing wellhead protection plans to protect groundwater supplies.

Figure 3

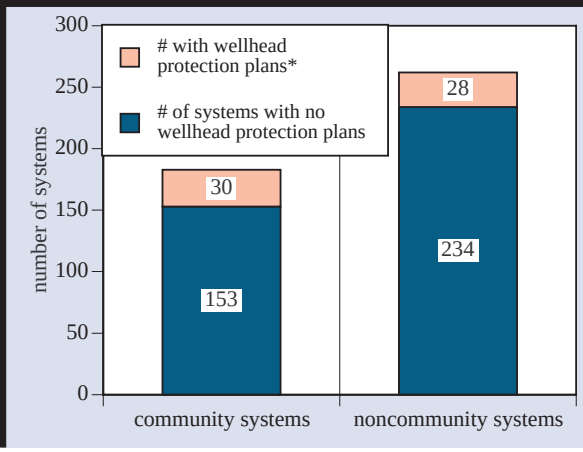
Public Drinking Water Systems in Ky. in Significant Noncompliance (1997)

Water System	County	Population Served
Kettle Island Water System*	Bell	396
Stoney Fork	Bell	125
Hillside Trailer Park	Boone	150
Wildwood Estates	Breckinridge	69
Keniana Homeowners Assoc.	Calloway	132
Isonville Elementary	Elliot	140
River's Edge Campground	Gallatin	122
Blue Diamond Camp*	Harlan	59
Wallace Farm	Jefferson	70
Jackhorn Water Supply*	Letcher	200
Millstone Water Co.*	Letcher	90
Whitesburg Municipal Water	Letcher	2,224
Upper Levisa Health Clinic	Pike	75
Total 13	**10**	**3,852**

*Note: As of April 1, 1998. Significant noncompliance defined as systems with 12 or more violations in a running year. *Indicates water system was a significant noncomplier in the 1996/97 EQC report. Source: Ky. Division of Water*

Figure 4

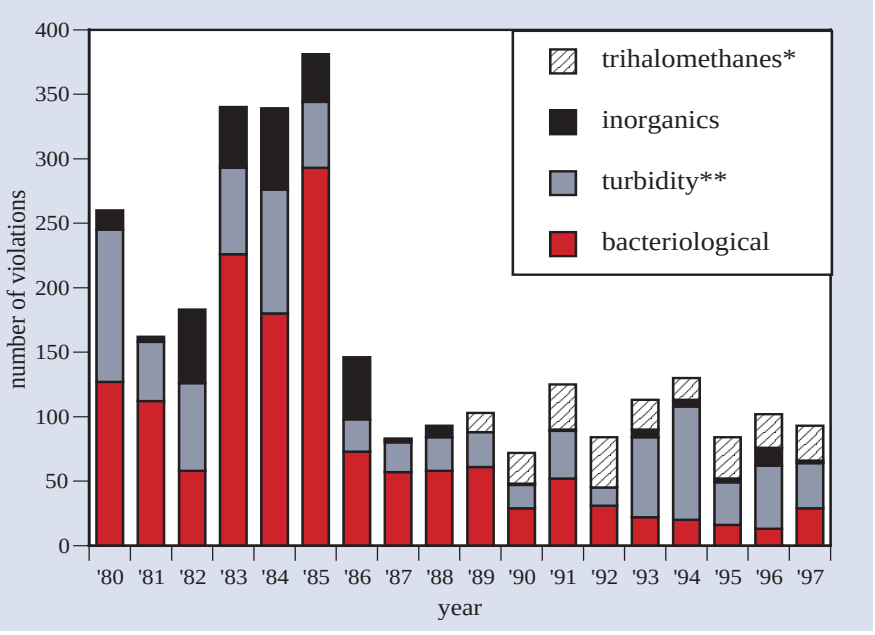
Drinking Water Systems in Kentucky with Wellhead Protection Plans



*Note: Based on systems dependent on groundwater as a drinking water source. As of Dec. 1998. * Plans approved or under development. Source: Ky. Div. of Water*

Indicator 2: Contamination of Public Drinking Water

Figure 5 Public Drinking Water Violations in Kentucky (MCLs)



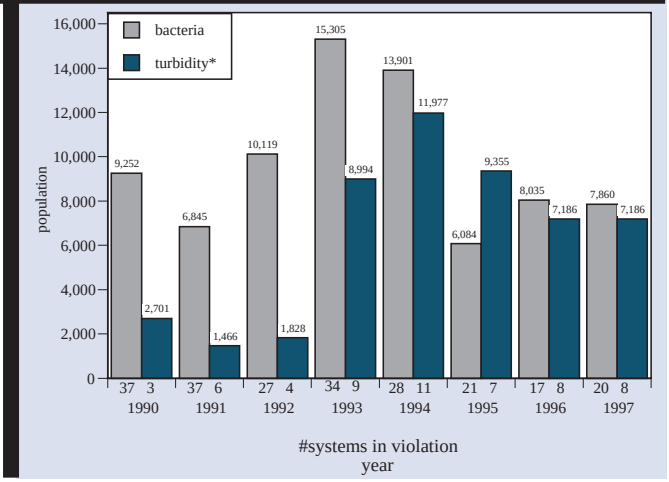
*Note: Based on violations of Maximum Contaminant Levels (MCLs) drinking water standards. *Trihalomethane monitoring not required prior to 1989. **More stringent turbidity standards took effect in 1993. Does not include monitoring and reporting violations for Phase II and V contaminants.*
Source: Ky. Division of Water

Background While public drinking water in the United States is considered among the safest in the world, its safety cannot be taken for granted. Violations of Safe Drinking Water Act standards continue to occur in Kentucky and pose risks to public health. For example, in September 1998, 8,000 residents of Logan County were boiling tap water after nematodes (microscopic worms) and Cryptosporidium and Giardia (pathogenic organisms) were detected in finished drinking water treated by the Russellville water treatment plant. Monitoring drinking water violation trends provides a strong indicator of how effective programs are protecting drinking water supplies.

Source The most common drinking water contaminants detected in Kentucky are bacteria (an indication water may be contaminated with fecal matter); turbidity or cloudiness (which can interfere with the treatment process and allow pathogens to survive); trihalomethanes (organic chemicals created during the disinfection of water with chlorine); and inorganics (which include nitrates and metals such as mercury and barium).

Goal Ensure public drinking water can be safely consumed by meeting federal and state Safe Drinking Water Act rules and regulations that specify 83 health-based Maximum Contaminant Levels (MCLs).

Figure 6 Population Served by Public Water Systems in Kentucky with Persistent Violations



*Note: Persistent violators are systems with four or more monitoring or MCL violations in any 12 month period. *More stringent turbidity standards took effect in 1993.*
Source: Ky. Division of Water

PROGRESS Trends reveal that violations of health-based MCL drinking water standards have declined significantly during the past 17 years in Kentucky. Of the 730 public drinking water systems operating in the state, 4%, or 34 systems, had MCL violations in 1997. The MCL violations cited in 1997 include: 29 bacteriological, 35 turbidity, 27 trihalomethanes, and two inorganics. In addition, the state cited 36 violations for inadequate treatment techniques and two for failure to filter. It should be noted that data from Phase II and Phase V chemical monitoring, which took place between 1993 through 1998 has not been compiled by the Kentucky Division of Water and is not included in the above numbers.

There are several facilities that are known persistent violators of MCL drinking water standards. During 1997, an estimated 38,799 Kentuckians were at risk from 27 public drinking water systems with persistent violations of bacteria and turbidity standards. Data reveal that there has not been any significant improvement in reducing the population at risk by persistent violators during the past three years.

Efforts to bring these and other drinking water systems into compliance continue. While a majority of violations cited at drinking water plants are resolved, some result in fines. In 1997, ten drinking water systems were fined a total of $16,950.

Figure 7

Persistent Water System Violators of Safe Drinking Water Act Standards

Facility	County	Pop. at risk
Kettle Island	Bell	396
Henderson Settlement	Bell	105
Hillside Trailer Park	Boone	150
Augusta Regional WTP	Bracken	1,801
Shouses MHP#2	Breathitt	35
Irvington Water System	Breckinridge	1,603
Wildwood Estates	Breckinridge	69
Hardinsburg/Rough Riv. Plant	Breckinridge	9,363
Lakeway Shores	Calloway	204
Green Acres Mobile Home Ct.	Carroll	92
Cumberland Co. Water Dist.	Cumberland	6,111
Imperil Mobile Home Park	Franklin	482
Evarts Municipal Water Plant	Harlan	2,121
Wallins Water System	Harlan	1,204
Blue Diamond Camp Water Syt	Harlan	59
Caney Creek Water District	Knott	343
Jamestown Village MHP	Knott	327
Whitesburg Mun.Water Works	Letcher	2,224
Jackhorn Water Supply	Letcher	200
Island Water Dept.	McLean	1,614
Brandenburg Water Works	Meade	3,283
Bloomfield Water/Sewage	Nelson	2,664
Tara Springs	Oldham	25
Tri-Village Water District	Owen	3,626
Glenwood Hall Resort	Owen	613
New Tribes Mission	Perry	60
Cumberland Mtn. Spring Water	Pike	25
Total 27	**19**	**38,799**

Note: Includes community water systems with monitoring, reporting and MCL violations. List does not include 12 transient and 1 non-transient plants listed as persistent violators. Persistent violators are systems with four or more monitoring or MCL violations in any 12 month period. As of September 1998. Source: Ky. Division of Water

Figure 8

Drinking Water Systems Assessed Fines in Ky.

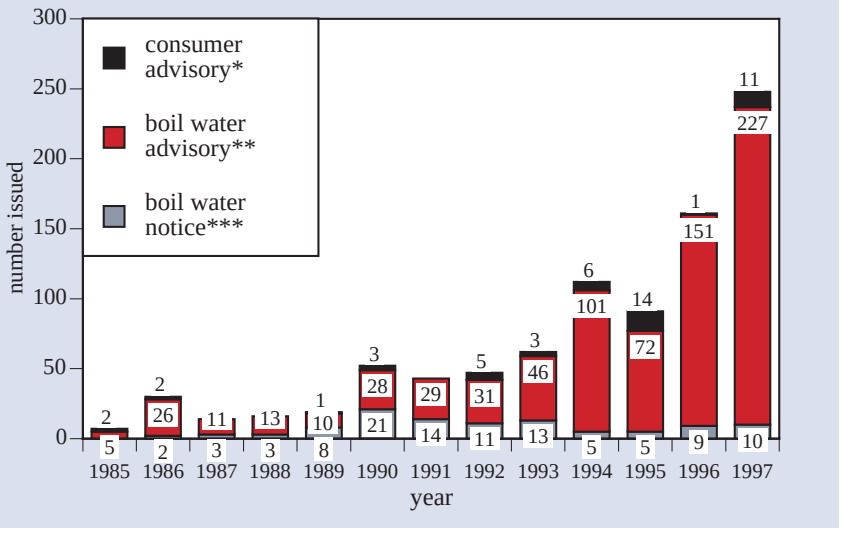
Year	#Systems	Fines*
1990	11	$41,585
1991	18	$59,950
1992	28	$69,825
1993	22	$71,125
1994	31	$62,300
1995	24	$44,375
1996	19	$66,850
1997	10	$16,950

*Note: Includes drinking water and water quality violations. *Includes total civil and performance penalties assessed by calendar year. Source: Ky. Division of Water*

Indicator 3: Boil Water Notices and Advisories

Figure 9

Drinking Water Advisories and Notices in Kentucky



*Issued when possible adverse health effect from consumption of water or when other information of interest to consumer exists. **Issued when there is potential for bacteriological contamination. ***Issued when evidence shows bacteriological contamination. Source: Ky. Division of Water

Background Bacteriological contamination is one of the most common violations of public drinking water standards. While violations of bacteriological drinking water MCL standards have declined during the past 17 years, the number of potential contamination incidents leading to boil water advisories has increased in recent years. The number of boil water notices and advisories provides an indication of drinking water quality in Kentucky.

Source Most drinking water advisories and notices are issued because of water line breaks. In many areas, drinking water distribution systems have not been maintained, resulting in deterioration, leakage, and failure. Some water systems in Kentucky lose as much as 50% of their treated water due to leaks and water line breaks, according to reports filed with the Kentucky Public Service Commission. Deteriorating pipes not only can cause water loss, but can be dangerous because of infiltration of contaminants during pressure losses.

Goal Ensure public drinking water can be safely consumed by ensuring that boil water advisories and notices are promptly issued.

Progress In 1997, there were 227 boil water advisories (issued when there is a potential for contamination) and ten boil water notices (issued when bacteriological contamination is confirmed), a dramatic increase from previous years. Although the exact reason for the increase in the number of boil water advisories cannot be determined, the Kentucky Division of Water generally attributes the rise to better education and awareness of water system operators and more consistent reporting of water line breaks.

Grayson Utilities (Carter County) led the state in boil water notices with 16, followed by Greenup Water Plant (14), Pineville Water System (13), Olive Hill Municipal Waterworks (13) and Flatwoods (11). These systems accounted for 30% of the 227 boil water advisories issued in 1997. Boil water notices were issued in Carroll, Garrard, Knox, Jessamine, Meade, Pendleton, and Taylor counties during 1997. Water systems in Grayson County (Grayson Co. Water District), Harlan County (Evarts Municipal Water Plant and Green Hills Water District), and Henderson County (Henderson Water Plant) had consumer advisories issued in 1997.

Boil water notices and advisories usually last a few days. However, some communities have experienced long-term advisories. For example, Evarts in Harlan County has had boil water advisories since 1994 due to turbidity problems. In August 1998, the city declared an emergency in order to be eligible for federal funding to resolve problems at the drinking water plant.

Indicator 4: Private Drinking Water Wells

Background Some 700,000 Kentuckians rely on private wells, springs, or cisterns for drinking water, according to the 1990 U.S. Census. In Kentucky and many other states, private drinking water sources are not required to be monitored for contamination, so it is not possible to determine the overall quality of this resource.

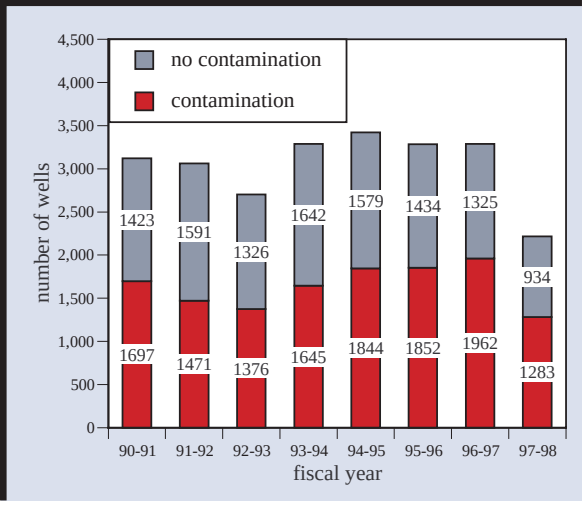
Source Groundwater fed drinking water supplies have many potential sources of contamination. Sources include leaking underground storage tanks, raw sewage from failing septic systems, straight pipes, and agricultural operations. Because large sections of Kentucky have karst topography, surface water and groundwater often mix, increasing the likelihood of groundwater contamination. Hand-dug and improperly constructed water wells are more susceptible to contamination.

Goal Ensure drinking water from private wells can be safely consumed by ensuring proper well construction and maintenance.

Progress A review of individual water wells tested by local health departments upon request by the well owner reveals 55% of the 2,216 water wells sampled during fiscal year 1997-1998, tested positive for total coliform bacteria—an indication the well may be contaminated. Contamination detected in water wells may not necessarily indicate the groundwater is polluted but rather might be the result of poor well construction, maintenance, or problems with home distribution systems. According to state health officials, many private water wells are not routinely tested or properly maintained.

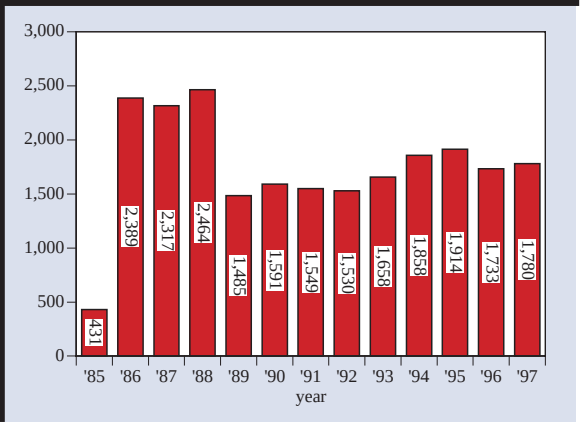
Kentucky has made progress in ensuring the safe construction of water wells. Since 1985, state regulations have required all water well drillers to be certified. Currently, 190 drillers are certified in Kentucky. During fiscal year 1997-98, 1,780 new domestic water wells were drilled in the state, according to state water well records.

Figure 10 Voluntary Testing of Private Drinking Water Wells in Ky. for Bacteria



Note: Tests of private wells for total coliform bacteria. All tests are requested by well owners.
Source: Ky. Department for Public Health

Figure 11 Number of Water Wells Reported Drilled In Kentucky



Note: Includes private drinking water, municipal, livestock, and irrigation wells.
Source: Ky. Division of Water

Indicator 5: Drinking Water Infrastructure/Supplies

Background Most of Kentucky's and the nation's drinking water infrastructure is more than 30 years old and many systems now require upgrades and improvements. The U.S. EPA recently completed a nationwide drinking water infrastructure needs survey. They discovered that 55,000 systems are in need of $12.1 billion in immediate upgrades to comply with the current requirements of the Safe Drinking Water Act. The total cost to repair and upgrade the drinking water infrastructure in the U.S. over the next 20 years is estimated at $138.4 billion.

Figure 12
Drinking Water Infrastructure Needs in Kentucky by System Size (1995)

System Size	Number*	Needs ($ millions)
Large	4	$ 612.2
Medium	178	$1,015.7
Small	521	$ 596.3
Total	**703**	**$2,224.2**

**Based on number of systems surveyed in 1995.*
Source: U.S. EPA

Source The Kentucky Division of Water indicates that most small to medium sized drinking water systems in the state are in need of repair or upgrading.

Goal Improve and maintain drinking water infrastructure, develop a statewide strategic plan designed to ensure that every household in Kentucky has access to potable water by 2020 (Executive Order 96-1339), and require water suppliers develop long-range water supply plans by July 15, 1998, later amended to July 15, 1999 (KRS151.114-118).

Progress Kentucky has made great progress during the past 50 years in building the infrastructure necessary to provide Kentuckians with safe and dependable supplies of public drinking water. Efforts to upgrade water treatment plants and distribution systems progress. Each year millions of dollars in grants and loans are invested in drinking water infrastructure. However, drinking water systems in Kentucky still need and estimated $116.7 million in repairs just to meet the requirements of the Safe Drinking Water Act and another $2.1 billion in improvements over the next 20 years. In 1996, Congress amended the Safe Drinking Water Act to provide states with $9.6 billion to help communities finance badly needed drinking water improvements. Kentucky was allocated $12.85 million in 1997 and $12.5 million in 1998, from a federal capitalization grant to set up a low-interest state revolving loan fund to finance drinking water repairs. Kentucky matched the grant by 20% as required by federal law. It is anticipated that the 1997 monies will initially fund 11 drinking water projects in Kentucky.

In an effort to provide all Kentuckians with access to safe drinking water, Governor Paul Patton created the Water Resources Development Commission in 1996. The Commission is mandated to develop a strategic plan designed to deliver access to potable water to an estimated 700,000 Kentucky households not presently served by a public water system. The Commission works with other state agencies to promote the use of geographic information systems and related technologies to provide drinking water systems with the tools necessary for more effective and efficient water service. The Commission recently completed a survey of 639 drinking water facilities and related infrastructure to determine the size and service potential of these systems.

Many public drinking water systems are also planning for their long-term water supply needs. In 1990, the Kentucky General Assembly passed a law mandating long-range water supply plans be developed by July 15, 1998 (later extended to July 15, 1999). Currently, all but 18 water suppliers have developed or are in the process of developing water supply plans.